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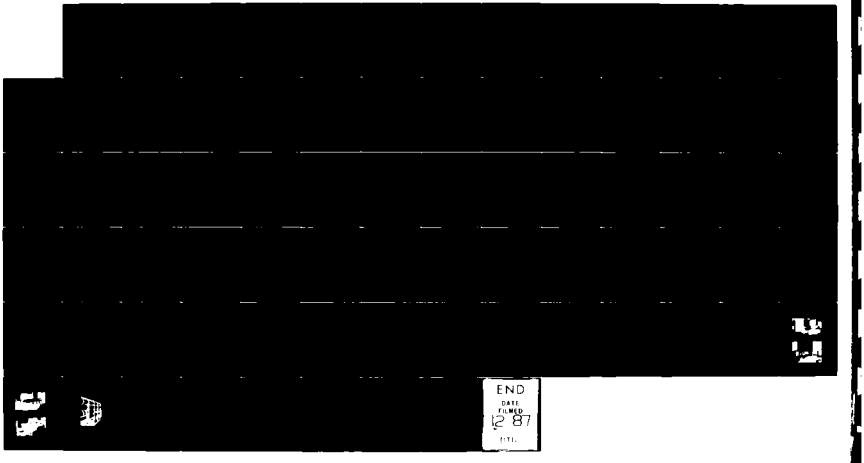

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A PROBLEM SOLVING PROJECT TO DETERMINE IF THE CENTRAL APPOINTMENT SYSTEM ADEQUATELY SUPPORTS THE OUTPATIENT WORKLOAD REPORTING REQUIREMENTS AT TRIPLER ARMY MEDICAL CENTER

by

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Submitted in Partial Fulfillment of the Requirements for the Third Quarter of the Residency in Health Care Administration

April 21, 1980

AD-A186137

SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

Form Approved OMB No. 0704-0188

1a. REPORT SECURITY CLASSIFICATION: Unclassified	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION/AVAILABILITY OF REPORT: Approved for public release; Distribution Unlimited
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S): 6 - 87	5. MONITORING ORGANIZATION REPORT NUMBER(S)
6a. NAME OF PERFORMING ORGANIZATION: U.S. Army-Baylor University Grad Prgm in Health Care Admin; 6b. OFFICE SYMBOL (If applicable): HSHA-IHC	7a. NAME OF MONITORING ORGANIZATION
6c. ADDRESS (City, State, and ZIP Code): Ft Sam Houston Tx, 78234-6100	7b. ADDRESS (City, State, and ZIP Code)
8a. NAME OF FUNDING/SPONSORING ORGANIZATION; 8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c. ADDRESS (City, State, and ZIP Code)	10. SOURCE OF FUNDING NUMBERS: PROGRAM ELEMENT NO. / PROJECT NO. / TASK NO. / WORK UNIT ACCESSION NO.

11. TITLE (Include Security Classification)
A PROBLEM SOLVING PROJECT TO DETERMINE IF THE CENTRAL APPOINTMENT SYSTEM ADEQUATELY SUPPORTS THE OUTPATIENT WORKLOAD REPORTING REQUIREMENTS AT TRIPLER ARMY MEDICAL CENTER.

12. PERSONAL AUTHOR(S)
Herbert K. Reamey III, Author

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (Year, Month, Day)	15. PAGE COUNT
Thesis	FROM July 79 TO Apr 80	21 April 1980	76

16. SUPPLEMENTARY NOTATION

17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	Hospitals; healthcare; medical information systems; central appointment systems; workload reporting.

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

This paper analyzed an automated central appointment system and its ability to support outpatient workload reporting requirements at an Army teaching hospital. The author studied various alternatives and presented disadvantages and advantages to all of the alternatives.

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT	21. ABSTRACT SECURITY CLASSIFICATION
☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT. ☐ DTIC USERS	
22a. NAME OF RESPONSIBLE INDIVIDUAL: Lawrence M. Leahy, MAJ, MS	22b. TELEPHONE (Include Area Code): (512) 221-6345/2324; 22c. OFFICE SYMBOL: HSHA-IHC

DD Form 1473, JUN 86 — Previous editions are obsolete. — SECURITY CLASSIFICATION OF THIS PAGE

TABLE OF CONTENTS

I. INTRODUCTION

Development of the Problem

One of the earliest rotations of this residency was through the Patient Administration Division (PAD). The rotation was thorough and detailed and appeared to be unremarkable until the Medical Statistics Section was visited. It was expected that this important but routinely small functional area would consist of one full time employee generating the few monthly reports required by current regulations. The best known of the reports is generally the Medical Summary Report (MED 302) and is a recapitulation of the work done during the preceding month within the clinics and treatment areas of the professional departments. This information is provided to the Medical Statistics Section (Med Stats) either by the departments directly or by the Management Information Systems Office (MISO) in the case, such as the present facility, where computer support is available.

Very suprisingly the Med Stats Section consisted of three full time employees that collected a significant amount of data and generated what appeared to be more reports than

was actually required. The employees worked at a feverish pace and even though the supervisor was patient and thorough in explaining the functions of the section, the explanation was confusing; so much so that the section was visited twice again in an attempt to determine exactly what was being accomplished. In interviewing supervisory personnel and other organization elements which either utilized or contributed to the data, it was determined that not much was known by anyone concerning the functions of the Med Stat Section. It was not determined where the numbers came from or in many cases why they were collected or what was their eventual use. The idea of using this particular area as a problem solving project began to formulate in that it was felt that the computer was "driving" the Med Stats Section to the extent that this section was collecting and summarizing data primarily because it was available. Generally the data remained data and was not changed into useful information as should have been the case. In several instances it appeared that the Med Stats personnel were correcting manually or serving in a cybernetic capacity when the computer should have done this for them. If this were true, then the procedures in this section could have been streamlined, automated or eliminated

as appropriate and the section reduced by one or more personnel. The PAD at present does not have a critically needed CHAMPUS advisor and the position generated by realigning the Med Stat Section could be made available for that purpose.

However in subsequent interviews with personnel from MISO it was learned that one computerized system served to make the lists of appointments for the various clinics on the Central Appointment Section (CAS) system, generate workload reporting cards for the clinics to utilize, and have these cards used by both the Med Stats Section and Comptroller Division to formulate their various workload reports. There are apparently organization structure problems as many of the clinics manually maintain their own log books as a backup system as it is apparently felt that the computer system does not accurately reflect the correct workload. Additionally, the CAS, PAD and clinics all have different inputs and primary interests to this system. The CAS is interested primarily in providing accurate information to the Central Outpatient Records Section and the appropriate clinics so that the correct records and patients will arrive at the proper clinic. PAD is interested primarily in data collection for the Med 302

report and the clinics are interested in primarily reporting the workload. The present system accepts errors on the patient reporting cards so if the card can be read by the computer, it will be accepted regardless of the accuracy or completeness. The clinics have learned there is no control on the system or reward for doing 100% accurate work so the error list is growing rather than decreasing according to the MISO chief.

Because of these errors, the monthly workload figures do not accurately reflect a true picture of the hospital. When it is not possible to determine which clinic the patient cards came from, they are applied against clinics whose workload appears to be less than normal. Compounding this inaccuracy, the cards are not always submitted in a timely manner so workload may then be credited against the following month. While the total TAMC workload is probably accurate, the distribution is not.

These problems are accentuated by the fact that only recently has the Clinical Support Division been properly staffed so there has not been an element given the authority and charged with the overall responsibility for this system.

In May 1980, Tripler Army Medical Center (TAMC) will receive a new Burroughs Model 1800 computer to replace the

present second generation hardware. The new system will utilize initially the same language and software presently used. If the problems in the system are not addressed and corrected, the new equipment will not have the full desired impact on the organization. Because of the new equipment coming on line, the changes allowed to the present software will be minimal.

With this information it quickly became obvious that the PSP could not be confined to the Med Stats Section but would include a significant portion of the entire TAMC organization.

Problem Statement

The problem is to determine if the present computerized central appointment system adequately supports the outpatient workload reporting requirements of Tripler Army Medical Center (TAMC); to discuss viable alternatives to the present system and to evaluate the advantages and disadvantages of these alternatives.

Limitations to Problem-Solving Options

In general, the limitations presently found throughout the federal government are the identical problems that limit

the realistically available options to this PSP. Foremost are the austere funding limitations and the critical shortage of personnel that is exacerbated by the two for one hiring policy. In other words, two employees must leave before one may be hired. With these restrictions, health care institutions such as TAMC provide few resources to administrative functions, prefering to concentrate instead upon maintaining present direct health care capabilities. This same philosophy is even more prevalent when considering 'new' administrative functions for the organization. To support the investment of resources in a new, non-direct patient care area would require a significant organizational change and overall staff support. This implies an educational process to sell the need for such a program and allow adjustment to the change. Briefly stated, the staff at TAMC is not information systems oriented and consequently does not see the potential that such a system offers to health care. This lack of interest will severely limit a major policy change from the status quo.

A limiting factor that should be considered is the socio-economic profile of the workforce. Many of these employees have been working at TAMC since its opening in

in 1948 and provide a very valuable institutional memory. This group has been a remarkably loyal and productive group and have become a very knowledgeable, reliable and resilient workforce. Considerable pride is taken in possessing detailed knowledge of their area of responsibility. They have established norms and standards as would be expected of a mature, fourth-level group and have the background to know what to expect in the way of resources in the yearly budget process and the less frequent manpower surveys. New employees are assimilated into these groups slowly and taught the standards and norms in the time honored methods of informal groups. Many of the wage grade and lower General Scale workers are having their positions examined for possible contracting-out under the CETA program. Any intrusion into their work area is viewed with suspicion.

Literature Review

A brief review of current literature in the field of information systems, management information systems (MIS) and hospital information systems (HIS) will quickly impress even the casual reader with the esoteric language and bewildering variety of topics that address this subject. The articles range from excellent informative general teaching vehicles

that present the topic in laymans language while employing a systems approach to more narrow scoped articles concerning single episodic ventures into the data processing field.

Examining recent articles, John Cochrane of the California Hospital Association reported that the quality of information was more important than was the quantity.[1] There were numerous articles available which gave practicle advice on how to computerize an organization,[2] ways to avoid over-computerization,[3] operation research techniques available to help design systems[4] and then establish controls over these same systems.[5] An example of how a Minnesota hospital system successfully installed an information system to the benefit of all of its consumers of health care was presented[6] in a very positive manner while a very logical and urgent need for such a system on a national basis was described by the Canadian Hospital Association.[7]

The greatest input however was from articles of the former category. Nolan in his article on the survival of hospital management,[8] very appropriately pointed out that computers of today are as superior to the computers of the mid-1960's (characterized by the IBM 1440) as the computers of that era were to the Number Mill invented by Charles Baggage in 1837. In spite of the unparalleled pressures

upon the nation's health care delivery system to provide high quality medical care to all strata of society at reasonable costs, beleaguered hospital management has generally failed to effectively utilize the most significant managerial development of this century-the computer! Hospitals have fallen behind other industries in their use of the computer.[9] This stagnation was apparently initiated by the federal government's 1971 economic stabilization program but reasons for its continuation are less clear. Certainly factors such as lack of pressure from non-financial administrators, the historically small data processing staffs employed by hospitals and the numerous examples of early, expensive failures and disappointments in attempting to computerize the hospital must be considered as contributors to this stagnation.[10]

Most hospitals that installed computers during the 1960's and early 1970's did so as a response to internal pressure from the fiscal officer; consequently, the data processing function was typically found, organizationally, under the Finance department and functioned primarily as an adjunct to accounting.[11] Scant attention was given to other administrative areas, much less the clinical departments and perhaps

with good reason. The computers and information systems of that period were grossly inadequate, very expensive, rigid and unreliable. Compounding the inadequacies of the hardware, the staffing requirements for data processing personnel to manage, define, communicate and implement a hospital system were routinely underestimated. The complexity of the patient encounter was severely underestimated during this era. Data base systems had not appeared and there were seldom any attempts to integrate the accounting computer with any other free-standing departmental computers which, by this time,were occasionally being seen.

While the hardware of the second and third generation were primarily large general purpose computers which attempted to satisfy clinical, communication and financial systems, the hardware of the forth and later generations has moved toward the mini and micro computers. Additionally, the vendors and shared computer service companies had developed field personnel who understood and supported health care needs.[12]

The critical appraisal of the stagnation of computers in hospitals may ultimately prove to be a blessing in disguise, for during this stagnation technology has matured appreciable.

Not only is the hardware more consistent, flexible and capable, it is much less expensive. The software has likewise developed to the point where it is now profitable for hospitals to move into HIS development. Hospital administrators have two basic strategies to choose from, batch or on-line processing.[13] Early applications were restricted to batch processing; in this type, groups or batches of information were submitted to the computer to be returned later. It is ideally suited to tasks that can be performed at intervals such as most of the accounting functions to include accounts receivables, payroll, payables and inventory. On-line processing users enter data at remote site terminals and receive results on video screens almost instantaneously. While on-line processing is more expensive to install, hospitals now have the option of developing applications such as effective patient care systems, that were impossible with only batch processing. Additionally, the on-line systems generally enhance the applications that are possible with batch processing. Thus in most cases, to accept batch processing is to opt for a more restrictive, limited set of capabilities.[14]

While the need of an on-line system is generally recognized, the need for data-base technology is less appreciated. Data base tecnnology supports the idea that data is a resource and should be available to the entire organization. An expensive lesson learned by private industry has been that the key to managing data processing is managing data and not the computer.[15] This concept has given rise to the organization position of Data Base Administrator replacing the MIS officers.[16] Ignorance of this concept has led to many of the non-standard, incompatible applications and data redundancy found in industry today. Data base technology, which is simply an internal system for organizing, structuring, locating and accessing data, has evolved to the point where it should be incorporated into the hospital data processing strategy.[17] This will allow the organization to share a common data base rather than application bound files, centralize and control the data and provide ad hoc reports almost upon demand. By using on-line data-base technology, a hospital is able to move into applications such as medical records, medical record chart control, pharmacy, order communication, laboratory, radiology, admission and disposition and nurse scheduling. Once patient demographic data

is captured, it can be shared throughout the organization reducing labor costs and increasing accuracy. In his survey of ten hospitals, Nolan states that while it will cost a typical 450 bed hospital $1,100,000 to install on-line processing, the quantifiable return on this investment will average $800,000 above costs.[18] This same survey revealed that unquantifiable results included a patient identification system that reduced fragmented records from 15% to 1%, a pharmacy system that dropped the medication error rate from 15% to .1% and a 19 hour reduction in laboratory test results turn around time. It is significant to note that none of these applications could have been addressed through a batch processing system.

While Bowen reports that there is considerable variation in the amount hospitals spend on data processing, hospitals in general spend adequately on equipment and personnel, but when compared to industry, far too little is spent on programs which would allow the development of productive data base systems. In the typical hospital, an increase of 5-10% of the data processing budget entirely devoted to new systems, would enable that department to increase their program development by 100-200%.[19] Whitted confirmed these figures by stating that the largest hospitals are not the most expensive

spenders on data processing as the mean cost per patient day decreases with the larger hospitals.[20] It was surmised by the Whitted study that there was a return to scale for hospital data processing in the large institutions.

Although the technology is available today most hospital administrators are unaware of it as witnessed when several administrators were asked "What would you like to have the computer do for you that it is not now doing?".[21] The replies were (1) Have computers readily communicate with each other (2) Have the computer used in the information gathering process and (3) Have the computer store patient information, patient origin and patient mix. It is a sad commentary indeed when one realizes that these requests were made by respected leaders, published in a widely read journal on hospital administration as an article describing current needs of management when the solutions to these requests were readily available through on-line, data-base systems!

Research Design

The first step in this research project was to determine which clinics were submitting outpatient workload data and the methods by which the data was being submitted. This was

accomplished by interviews with personnel from individual clinics, the Clinical Support Division, the Central Appointment Section (CAS), MISO, Patient Administration Division (PAD) and the Comptroller Division. TAMC guidelines on this topic were studied as were previous management surveys and routine summary documents such as the Medical Summary Report. Clinics that provided outpatient workload data even sporadically, surfaced in one or more of these areas.

Since the paramount concern to this project was the relationship between the Central Appointment System and the workload gathering methods, the steps involved in reporting on outpatient clinic visit were documented and modelled. This model captured the steps from the time the clinic schedules were submitted to CAS to the final summation of all workload data for a certain period of time by MISO. The system worksheet preparation was necessary to develop an understanding of what this system consisted of an to obtain an overall, indepth picture of the process. The flowsheets are found at Appendix A.

At the completion of the modelling procedure, interviews were conducted in thirty clinics within the hospital to obtain a feeling and understanding of how the clinical personnel

viewed MISO and the importance they attached to these administrative requirements. A sample list of questions asked during each interview is enclosed at Appendix B.

Following the interviews a statistical analysis was made of the gross outpatient workload figures for the period November 1979 through March 1980. This was accomplished to obtain data on how most of the clinics submitted their workload figures. The workload figures for the CAS clinics were then compared to the non-CAS clinics. To determine which types of clinics were most efficient as measured by accuracy of workload submitted, the error listings for November 1979 through March 1980 were examined, the clinics divided into either CAS or non-CAS clinics and the percentage of errors for each group were compared.

Alternative Solutions

It was decided that there were two realistic alternatives in this PSP: (1) To continue with the present arranagement using a combination of manual and mechanized means of making appointments and submitting workload data by any of the several methods presently in use or (2) to automate all or part of the system by use of remote, interactive computer

terminals in the clinic areas which would facilitate a standardization of the submission of outpatient workload data.

The primary advantage of the first alternative was that it is the easier of the two to accommodate. The personnel and idiosyncracies are known and there would be no staff education requirements or organization trauma that normally accompanies any major change. The disadvantage would be that nothing would change; the same inefficiencies and disjointed, uncoordinated reporting cacophonies would continue to exist. The potential gains for both health care and education would not be realized.

The advantages of the second alternative, to automate part or all of the system, is that the system would become less labor intensive with the elimination of most data redundancy in the outpatient clinics, the accuracy should be very close to 100% and the reporting mechanisms would be uniform for all clinics. The disadvantages to this alternative would be the education and training requirements for the staff to enable them to appreciate and fully comprehend the need for and capabilities of this system. This alternative would require structure and organization change and as with

any change a certain amount of organization disfunction would occur during the initial operational phases.

Evaluation of Alternatives

After the data has been collected, analyzed, evaluated, and the alternatives discussed, the alternatives will be evaluated, using cost and work capacity as the criteria, through the application of a linear programming technique. This technique was selected to facilitate making the best possible decision concerning valuable and scarce resources in an uncertain environment. The object will be to maximize composite health service benefits given the present limited available resources.

II. DISCUSSION

Present System

There are several methods which TAMC outpatient clinics use to report their workload. The oldest, easiest and least informative method is by simply making a mark for each patient treated and summarizing the marks at the end of the day, week and month. This method is commonly referred to the "Tally Sheet" method; at TAMC it is accomplished by using TAMC Form 381, Clinic Visits Tally Sheet. Major clinics using this method include all of the orthopedic clinics, the ENT clinics, physical therapy clinic and most of the clinics located at Schofield Barracks (SB). The only information extracted from these tally sheets are the clinics, patient category and patient age groups as this breakdown is required for the Medical Summary report. Summary cards are prepared from the Tally Sheets and integrated into the Medical Summary report at the end of the reporting period. These visits do not appear on any of the error listings provided by MISO.

Perhaps the best known method of making an appointment is through the Central Appointment Section. This method has been found within the Army since the early 1970's and the

beginning of the Ambulatory Care Program (APC). At TAMC the CAS function is performed by a total of ten personnel consisting of one civilian supervisor, eight civilian appointment clerks and one military messenger. The information required to make an appointment through CAS is extensive and time consuming but necessary to insure that the patient, the provider and the medical record arrive at proper clinic at the correct time. Close coordination is necessary among the patient, the clinic and the provider and it is the coordination function that the CAS is called upon to fulfill. One of the advantages to the CAS is that a large volume of useful information is collected and summarized in a standard format.

The workflow sheets for the CAS procedure are available at Appendix 1, but stated as briefly as possible, the steps are as follows:

1. The clinics provide their schedule (TAMC Form 305) to CAS, 90 days in advance.
2. CAS reviews the schedules for accuracy and sends them to MISO.
3. MISO punches appointment cards with the clinic and doctor codes, the date and the time of the appointment.
4. The cards are returned to CAS where they are filed by the doctor and clinic.

5. Patients call CAS for appointments and the appointment cards are initiated with the demographic data of the patient.

6. The completed cards are returned to MISO, where the cards are edited and an error listing for CAS is prepared.

7. CAS corrects the error list and returns it to MISO.

8. MISO keypunches the appointment cards and returns them to CAS where they are held until two days prior to the appointment.

9. CAS then returns the cards to MISO where rosters are prepared for each clinic and physician. Rosters are also prepared for Radiology and Outpatient Medical Records Section, requesting records as appropriate.

10. The roster and the appointment cards are returned to the clinics the day before the appointment by CAS.

11. The patient has the appointment and the clinic adds the diagnosis code and procedure code(s), if appropriate, to the appointment cards.

12. The cards are categorized by the clinics, picked up and returned to MISO by the CAS messenger on a daily basis.

13. MISO prepares an error listing and returns the

error listings to Med Stats and Clinical Support Division who sends them to the clinics for correction.

14. The error listings are returned to MISO where summary cards are prepared.

15. At the end of the month, the summary cards from all clinics are totaled and the Medical Summary report is prepared.

16. For "Walk-In" (unappointed) patients that appear at any outpatient clinic, TAMC Form 287-3, Walk-In Visit Worksheet is prepared and sent to the MISO where an appointment card is punched and the information follows the same sequence as outlined for an appointed patient.

The forms used in the CAS system and a list of the CAS clinics are found at Appendix C.

In an effort to standardize the clinic appointment system and meet the requirements of the Ambulatory Patient Care Program, thirty-one clinics that make their own outpatient appointments now collect the same information from patients as the CAS appointment clerks. The patient data is recorded on TAMC Form 287, Clinic Appointment Worksheet - Mornings and TAMC Form 287-1, Clinic Appointment Worksheet - Afternoons. These forms are sent to MISO two days prior to the appointment, MISO keypunches cards and provides an appointment list that

is returned to the clinic the day prior to the appointment and the data is handled in the exact manner as the CAS clinic data. In fact the only real difference between these two mechanisms is the manner in which the appointments are made. Copies of the non-CAS clinic forms and a list of non-CAS clinics may be found at Appendix D. It is interesting to note that the Family Practice Clinic is a non-CAS clinic but uses a TAMC Form 287-2 as the vehicle for recording appointments. The only difference between this form and the earlier mentioned forms is some redundant information such as the clinic code for Family Practice, is pre-printed onto the Form 287-2.

It should be mentioned that some clinics which submit workload data do not make any appointments; the major clinics in this category are the Emergency Room, Acute Minor Illness Clinic and the Troop Medical Clinics at Schofield Barracks. These clinics are strictly on a walk-in basis and utilize only the Tally Sheets to record their workload.

The above discussed mechanisms are the primary methods by which workload data is recorded, summarized and reported.

Problems With The Present System

A very interesting portion of this project dealt with the interviews that were conducted between October 1979 and April 1980. A variety of personnel were interviewed to include the Chief of MISO, several of the MISO staff, three major clinical department chiefs, several clinical service chiefs, NCOIC's and clerical personnel for thirty clinics, as well as several staff physicians. In addition to this group, personnel in Patient Administration Division, Comptroller Division, Clinical Support Division and Force Development Division were also interviewed. While a separate questionnaire was not kept on each interview, the questions found on the sample questionnaire at Appendix B were asked to each interviewee. Some general impressions that resulted from this survey were obtained and reinforced several teaching points made during the didactic phase of this program.

(1) Communications is very difficult to accomplish in an organization such as TAMC. Many personnel were concerned only with their own areas of responsibility and did not view it as a part of an overall system. This was particularly true among the more junior personnel.

(2) Many personnel were unaware of the importance of workload reporting, reviewing it as another administrative procedure to be endured and consequently assigned this task a low priority.

(3) The computer is a large impersonal and remote entity that is easy to find fault with regardless of the origin of the problem. Several personnel were not aware that TAMC even had a computer and very few of them even knew where it was located or what it did.

Concerning the first question "Do you trust the computer?," the overall response was a begrudgingly yes. Those clinics supported by CAS were much more trusting than any other category of clinic. The least trustful group were the clinics that submitted data by Tally Sheet. The more knowledgeable of the system the personnel were, the more trustful they were.

The second question "Have you met any of the MISO personnel?" was answered yes by at least one person in each clinic. The NCOIC, secretary or clerk were the personnel most likely to have met the "computer people." This question supported the first question in that the more personal contact the clinics had with MISO, the more trusting they

were of each other. In a few cases, personnel from other departments such as CAS, Force Development, PAD and Comptroller were thought to be from MISO. In three different clinics, changes prompted by the Uniform Chart of Accounts were attributed to MISO. In two separate clinics, personnel were very supportive of MISO and expressed empathy through comments such as "Their (MISO) job is thankless" or I wouldn't have their job for anything." The department chiefs and senior service chiefs routinely knew the Chief, MISO but physicians below this group were uninformed as to who the MISO personnel were and to a large extent, what they did.

The third question, asking if the clinic workload figures normally agreed with the computer's workload figures, provided the biggest surprise. From the negative reputation of the MISO that is normally found in the professional areas, it was expected that most replies to this question would indicate wide discrepancies but this was not the case. In the thirty clinics, twenty-five responded with a strong yes with five providing equally strong no replies. None of the twenty-five clinics that responded yes kept any sort of duplicate records of their workload figure. Several of the clinics that responded yes, stated that a year ago

there were frequent disagreements but these problems had been totally eliminated. Three of the clinics responding with a no kept log books but when the clinic figures were compared to the MISO figures, the two sets of numbers were almost identical after several months indicating that the real problem was the delinquent submission of cards or the delinquent correction of error cards. There was not a discrepancy greater than 2% found in any of the clinics. The three clinics that kept separate workload figures were all small, low volume clinics. In one of these three clinics, the secretary stated that the numbers had no meaning anyway since regardless of the volume, the clinic was always staffed by two physicians and the secretary. That's the way it had always been and she was positive it would always continue to be. Under more detailed questioning, the other two "no" clinics admitted they really just had a gut feeling that the numbers were different and could not substantiate their feelings.

An unusual occurrence took place in one of the twenty-five clinics responding yes; the numbers were different but the MISO figures were always equal to or greater than the clinic figures. This was not pursued in any depth

except to determine that patient visits were recorded in three different locations and the MISO had input from all three while this secretary usually had only two locations recorded. It was also noted that during her leave period, the clinic figures agreed with the MISO figures.

The last question, asking for system improvements, received the plea,to lessen the amount of paperwork required, during virtually every interview. Most personnel agreed that workload figures were important, that CAS reduced clinic congestion and saved manpower and that MISO attempted to do a good job but all were adamant in their desires to reduce the amount of paperwork involved in this process.

At the conclusion of the survey, it was felt that the reputation of MISO was much worse that it deserved to be and that much of the criticism is directed at MISO from habit.

Much of the organization assumed that anything that had to do with the computer meant more work for them and that the computer would probably not treat them fairly. As the interviews progressed, it became clear that the feelings of clinical personnel could not be substantiated by figures and facts. It was also apparent that most personnel did not understand what the computer did or how they fit into

the picture. On the other hand, MISO generally felt that the clinics were irresponsible and possibly a little lazy for not filling in the cards accurately and timely. Due to poor communications and a lack of understanding from both parties, a 'we-they' situation was developing between these two groups. An education of workers is needed at all levels to develop an appreciation of the diversity and enormity of tasks facing both of these groups; these differences subsequently lead to different priorities and values. An overview of the entire system--a system approach--would benefit all aspects of this particular function and would hopefully help both groups to understand the pressures and demands placed on the other group.

Examination of Workload

The gross workload figures for the period November 1979 through March 1980 were collected and examined and several comparisons were made. The total number of appointments for TAMC was the base against which most figures were compared. Several facts need to be reinforced: (1) Schofield Barracks, located approximately 18 miles from TAMC, is the home of the 25th Infantry Division and during this project

performed 30.6% of the outpatient workload recorded for TAMC. None of Schofield Barracks (SB) clinics or Troop Medical Clinics are on the CAS but a limited number do appoint patients using the TAMC Form 287 and 287-1, which result in cards being prepared by MISO and the subsequent generation of error lists. (2) The only appointments appearing on the error lists are those appointments for which appointment cards have been prepared. These are referred to as "carded" appointments. (3) The Tally Sheet clinics do not appear on any lists until the end of the month summaries are made.

The total figures for the project period are as follows:

	TAMC Outpatient Visits	SB Outpatient Visits	Monthly TOTALS
Nov 79	41,289	19,958	61,247
Dec 79	33,986	17,894	51,880
Jan 80	52,247	19,965	72,212
Feb 80	48,635	20,968	69,603
Mar 80	48,637	20,338	68,975
TOTAL VISITS	224,794	99,123	323,917

In order to obtain an understanding of the workload performed by CAS clinics verses the workload performed by the non-CAS clinics, the workload during the sampling period was collected by clinic and placed into whichever category the clinic belonged. The two categories for this display were CAS appointments or carded appointments, meaning those clinics making their own appointments but using the TAMC Form 287 or 287-1.

	CAS Appointments	Total Carded Appointments	Total Outpatient Visits
Nov 79	14,351	27,570	61,247
Dec 79	12,876	28,226	51,880
Jan 80	16,144	29,935	72,212
Feb 80	15,773	33,574	69,603
Mar 80	15,603	30,361	68,975
TOTALS	74,747	149,666	323,917

Dividing the total CAS appointments by the total number of outpatient visits, it is learned that the CAS appoints 23.1% of all outpatient visits to TAMC. During this period 46.2% of all outpatient visits recorded for Tripler had appointment cards prepared for them. It is also interesting to observe that 74,747 of the 149,666 carded appointments were appointed by CAS; stated differently, CAS obtained the

the data for 49.94% of all the appointments for which cards were prepared. In summary then, there were 323,917 total appointments of which 149,666 (46.2%) had appointment cards prepared; CAS appointed 49.94% of the patients for which cards were prepared.

Error Rates

Twice each week, MISO collects all of the completed appointment cards, those cards for patients that have completed their particular outpatient visits, for both the CAS and non-CAS clinics and prepares a list of all errors found on those cards by clinic. The error listings are distributed to each clinic, Clinical Support Division and the Medical Statistics Section for correction. Ideally, the corrections are made, the lists returned to MISO and the correct information is entered into the computer.

The error listings for the sampling period were examined and the numbers of errors for all CAS clinics and all non-CAS clinics were obtained.

	CAS CLINICS		NON-CAS CLINICS	
	ERROR CARDS	TOTAL CARDS	ERROR CARDS	TOTAL CARDS
Nov 79	1,478	20,845	535	10,716
Dec 79	970	18,664	712	9,589
Jan 80	1,115	19,507	617	6,987
Feb 80	906	17,200	472	8,992
Mar 80	956	20,388	315	8,702
TOTALS	5,425	96,604	2,651	44,977

Dividing the total number of error cards from CAS clinics by the total number of cards from the CAS clinics, an error rate of 5.62% for the test period is obtained. With the non-CAS clinics, an error rate of 5.89% is obtained using the same methods. At some point in the past, the TAMC commander made the decision that all error cards would be counted in the workload totals rather than loose this documented effort because of a clerical error. The only errors that could not be accepted into the computer were incorrect clinic codes and incorrect patient cateogires as this information is required for the medical summary report. The cards that contain either of these types of errors are sent from MISO to the Medical Statistics Section for correction as med stats is utlimately responsible for

The Medical Summary Report. Routinely the error cards returned to the clinics are returned to MISO late if they are returned at all; with the desire to submit all workload data in a timely manner, the decision was made to have all the patient category and clinic code errors corrected by medical statistics personnel and not to worry with correcting the other errors.

During some of the early interviews with personnel from PAD and MISO, an opinion frequently expressed was that the error list was extensive, increasing and as a result, there were many cards that had to be randomly distributed to various clinics using questionable patient categories. These fears were not verified by the data collected during the study of this system. The error rate was within a narrow range, 3.62% to 8.83%, with no detectable trend; the error rate average was almost identical for the two categories of clinics. The computer program now in use requires the computer to identify those cards with incorrect clinic codes as an unidentifiable clinic and print it on the error listing. There were only eleven of these cards designated by the computer during the project. The overwhelming majority of the errors then were in locations other than the patient

category or clinic code. While data was not available on the summary of the types of errors, it was observed that many errors were redundant, inconsequential ones such as the date missing or no primary care clinic indicated. Since most errors were made in areas that were not critical and the error rate was constant at approximately 5.4% for all clinics, this low error rate is remarkable; particularly so when it is realized that the clinics are not receiving any extra workload credit or benefit for entering the doctor, diagnosis and procedure codes. A 94.6% accuracy rate must be considered very good for non-critical requirements.

The Future

The future for hospital information systems in general and TAMC in particular will be dynamic. Hospitals are far behind industry in the use of computers and information systems. The Army is no exception to this observation and is in many instances hampered by bureaucratic agencies such as TRIMIS.

The Army health care delivery system has the same reason to computerize as the rest of industry. It is a labor intensive industry that uses copious amounts of data from a

variety of resources. The regulatory requirements placed upon the private sector are equally demanding within the federal arena and will continue to increase. With the present emphasis on the quality and consistency of care, medical documentation through use of the computer will increase timeliness of care by improving feedback to physicians, reduction of errors and provide automatic follow-up reporting to assist compliance with prescribed care. The emphasis on planning within health care delivery is also supported well through computerization; this becomes particularly important when it is realized that health care planning is essential to comply with cost containment incentives and increasing regulatory requirements. Lastly, during the past decade, the cost for computer hardware has dropped sharply while the data processing capability has increased just as precipitously. Complimenting this economy have been dramatically improved software applications. A 1975 AHA survey showed that 80% of all hospitals at that time had at least one function that was computer assisted. While most programs were in the traditional business functions, a 1976 survey by the Hospital Financial Managers Association indicated that more than half of U.S. hospitals would be

using some type of on-line information system in the very near future.[22]

Within large hospitals, most administrative functions that are profitable to computerize have already been automated. The future benefit of the computer lies within the clinical and ancillary systems of hospitals. With rising labor costs in a labor intensive industry, the cost effectiveness of hardware and availability of good software, the logical step is for hospitals to computerize with interactive, on-line, data-base systems. The computers in hospitals of the immediate future will facilitate a hospital-wide communication system to provide accurate and rapid order entry, results reporting, patient preparation and scheduling, and inventory control. In the pharmacy a computer can print labels, maintain a formulary, keep a patient drug profile, generate automatic reorders or stop-orders and analyze and report dangerous drug reactions. In radiology, a computer will be able to schedule patients, equipment and personnel, control film locations and recall a patient's x-ray history. In the laboratory, a computer can label specimens, schedule workload, maintain patient test results and laboratory statistics and provide quality control. Computers are already used in physiological monitoring in intensive care

areas, operating rooms, cardiac catheterization laboratories, pulmonary functions, radiation therapy and nuclear medicine. In the laboratory a computer is already combined with sophisticated electronic instruments such as the SMAC. Computers assist in diagnostic treatment and interpretation in nuclear medicine, radiation therapy and ECG clinics. A hospital wide data base system can eliminate redundant data, costly files and manpower and provide health care personnel with a comprehensive and current summary of all the various computer assisted programs such as those mentioned above on each patient.[23]

In Honolulu, The Queen's Medical Center, a public, non-profit, richly endowed institution is installing such a system. Photographs of the computer room of this facility appear at Annex 5. This system is on-line, data-base and hospital wide. As can be seen from the photographs, most of the hardware, of which the centerpiece is an IBM 3031 computer, is presently in place and supporting most of the business and finance functions, the outpatient clinics, admitting and some of the ancillary services. The programs to bring in the rest of the ancillary systems and clinical departments are being designed and implemented; the entire

system will be in operation by mid 1982. The staff at the hospital plan to incorporate the computer services at a time in the future and sell services to other local facilities, even further reducing the costs per patient day. At Queen's, the computerized programs of the future are present and operating now.

At TAMC, a Burrough's Model 1800, which is a large versitle, reliable, forth generation computer will be installed this summer. It is capable of providing central processing capabilities for virtually any system TAMC decides to implement. TRIMISS personnel toured TAMC and briefed various staff members during November 1979 and indicated that several systems would be offered in the next one to five years; these packages include Pharmacy, Admissions and Dispositions, Food Service Division, the laboratory and others. Many of these functions can be accomplished through a data base, on-line system and the TAMC hardware is certainly capable of handling these and other applications.

Returning to outpatient workloads, the demand for outpatient visits as opposed to inpatient care will certainly increase and even more inpatient functions will be offered on an outpatient basis. To best utilize professional time and talent, obtain maximum benefit of limited facilities

in the most economical manner possible, it will become more and more prudent to examine the scheduling of outpatients and subsequent collection of workload data through the use of a computerized system. The demand for data, such as presently collected at TAMC CAS appointments will certainly increase. The use of outpatient diagnosis and procedure indices were discussed at the 1980 ACHA Conference and are a distinct possibility for a future JCAH requirements. Tripler is fortunate to have the rediments of such a system already operational. The collection on the present data extended to all outpatient encounters would be a valuable teaching tool, an asset to research and valuable in epidemiological studies. As far as could be determined TAMC is the only Army hospital with a system capable of collecting this data already in use. The problem becomes how to collect the data for all outpatients in an environment of limited resources and at the same time be flexible enough to interface with the proposed TRIMIS information system.

Analysis of Alternatives

To extend the present manual CAS to the approximate 65,000 outpatient visits recorded each month will require the following resources.

The present CAS appointment clerks perform approximately 70 appointments per work day or 1,540 appointments per month. Dividing the 1,540 appointments per clerk into the average total monthly appointments of 65,000 and a requirement of 42.2 appointment clerks is recognized. The average annual gross salary of a GS-4/5 is $12,812.63; per month the average gross salary becomes $\frac{\$12,812.63}{12}$ = $1,068.00. Multiplying the number of appointment clerks by the monthly salary, 42.2 X $1,068.00 and the cost per month is $45,069.60 with a gross annual salary expense of $540,835.20.

Looking at the second alternative, to automate the CAS system, a linear programing technique was used to minimize the cost(Z) through the best combination of scarce resources, namely personnel (P) and interactional computer terminals(T).

The cost to lease a Burrough's terminal that will perform the desired functions and interact with the new computer is $235.00 per month. The new Burrough's 1800 is capable of serving 40 of these terminals. It is estimated that with the new terminals an appointment clerk normally capable of making 1,540 appointments per month would be able to make 3,080 appointments per month. Furthermore, during the survey of the clinics it was estimated that there are approximately 35 personnel involved each month in making

appointments under the present system. With this background, limits and constraints, the problem set up as follows:

The object was to minimize cost

$Z = \$1,068P + \$235T$

Where: P = appointment clerks

T = computer terminals

Z = cost

Constraints

(1) $1,540P + 3,080T = 65,000$

$T \leq 40$

$P \leq 35$

(2) $P = T$

$P > 0$

$T > 0$

(1) $1,540P + 3,080T = 65,000$

Set $3,080T = 0$

$\therefore 1,540P = 65,000$

$P = 42.2$

Set $1,540P = 0$

$\therefore 3,080T = 65,000$

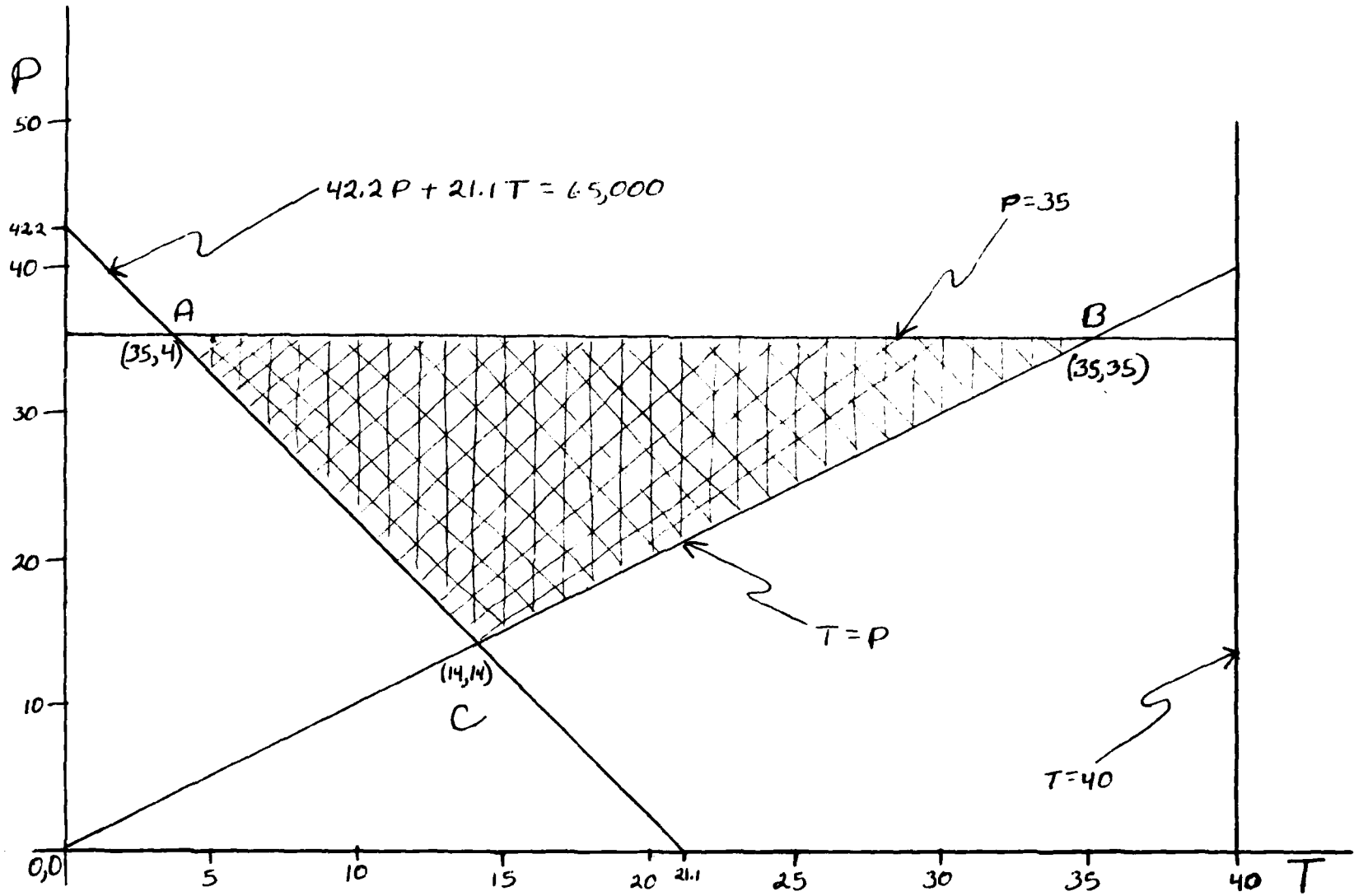
$T = 21.1$

(2) $P = T$

$\therefore 5P = 5T$

$10P = 10T$

$40P = 40T$


P
50
42.2
40
30
20
10
0,0
5
10
15
20
21.1
25
30
35
40
T
42.2 P + 21.1 T = 65,000
P=35
A
(35,4)
B
(35,35)
T=P
(14,14)
C
T=40

From the graph, the following coordinates for the three corners were obtained:

AT A (35,4) Z = 1,068(35) + 235(4) = $38,320

AT B (35,35) Z = 1,068(35) + 235(35) = $45,605.00

AT C (14,14) Z = 1,068(14) + 235(14) = $18,242.00

Therefore, the most cost effective method of automating all 65,000 appointments per month is to choose method C, which consists of fourteen appointment clerks and 14 computer terminals. This has an annual cost of $218,904.00 or less than half of the cost associated with a manual system and it satisfies all constraints of this situation.

III. CONCLUSIONS

Having examined the present system, the problems of the present system, needs of the organization and the future it becomes obvious that TAMC should automate the CAS system for the following reasons.

1. More than twice the amount of work can be done at approximately one half of the cost of maintaining the present system.
2. The hardware is being installed that will accommodate this system and supporting software is available.
3. All indications point to increased regulatory requirements for much of the data that would be captured using an automated system.
4. This would defuse the complaints against the present CAS while at the same time maintaining the desirable features.
5. The data collected would be accurate, standardized and eliminate manual cybernetic functions presently performed by CAS and Medical Statistics Section. This data would lend itself to teaching, research and epidemiology studies.

6. Since more work would be performed by fewer personnel at a cheaper cost, there is a lost opportunity cost incurred by not implementing this sytem. There would be personnel spaces generated that could be used in other critically short areas of the hospital.

7. This system will be a part of hospital wide information systems that will be a part of this facility in the not to distant future.

Returning to the original problem statement, it is concluded that the CAS system adequately supports the approximate one-fourth of the total outpatient visits that it appoints using the criteria of accuracy and timeliness. It is obvious however, that it is both possible and prudent support all TAMC outpatient encounters by an on-line data base computer system that will standardize all data gathered, require fewer personnel and be less costly to operate.

FOOTNOTES

[1]John Cochran "On Managing" Hospital Forum (19/1) (June 1976): p.21.

[2]Virgil D. Guthrie "An Easy, Painless Way To Computerize" Hospital Financial Management 32/4 (April 1978): p.34.

[3]Meta Parker et. al. "The New York Crisis" Hospital Financial Management 33/1 (January 1979): p.38.

[4]Larry D. Shuman, et. al.Operations Research In Health Care. Baltimore: The Johns Hopkins University Press, 1975: p.264.

[5]William W. Holder. "Use Flowcharting To Define Control Procedures." Hospital Financial Management 32/7 (July 1978): p.9.

[6]"A Minnesota Hospital Management Information System Proves Itself." The Office 90/4 (October 1979): p.120.

[7]Jean-Claude Martin "The Need For A National Framework For Hospital Management Information Systems." Dimensions *In Health Service* 56/3 (March 1979): p.6.

[8]William E. Bowen, et.a. "Computers and Hospital Management: Prescription For Survival" The Journal of Medical Systems 1/2 (February 1977): p.27.

[9]Ibid.

[10]Marion J. Ball and Thomas M. Boyle, Jr. "Hospital Information Systems: Past, Present and Future." Hospital Financial Management 34/2 (February 1980): p.12.

[11]Ibid., p.24.

[12]Ibid., p.14.

[13]**Bowen**, p.17.

[14]Ibid.

[15]Richard L. Nolan, "Computer Data Bases: The Future is Now." Harvard Business Review (September-October 1973): p.46.

[16]Ralph Fennesy, IBM Lecture on Data Base Concepts, Honolulu, Hawaii, April 2, 1980.

[17]Nolan, Survival, p.28.

[18]Ibid, p.21.

[19]Ibid, p.29.

[20]Gary S. Whitted, "What To Expect From Electronic Data Processing In Medical Centers," Health Care Management Review 3/1 (Winter 1978): p.57.

[21]Western Viewpoint "What Would You Like To Have the Computer Do For You That It Is Not Now Doing?" Hospital Forum 22/6 (September-October 1979): p.23.

[22]A. G. Battle and David A. Rey "Current Status and Trends of Hospital Information Systems." Topics In Health Care Financing 4/4 (Summer 1978): p.15.

[23]Myron G. Odell "Clinical and Ancillary Systems" Topics in Health Care Financing 4/4 (Summer 1978): p.33.

APPENDIX A

WORKFLOW MODEL OF CAS

SYSTEM TITLE: Patient Appointment System

PROCEDURES												
CAS receives patient appointment schedules from the clinics.	Schedules sent by mail	Clerical skills and equipment in CAS	Input	Appointment schedule	I	TAMC Form 305		Used to pre-punch appointment cards, TAMC Form 648				Reg. six weeks in advance usually
CAS reviews schedules	Source frequency	Clerical skills	P	Appointment schedule	P	TAMC Form 305						Schedules are accurate.
CAS sends schedules to MISO		Clerical skills	O									MISO appropriately handles from CAS
MISO punches appointment cards	Source file with data necessary for punch	Keypunch operator	P	Appointment cards	P	TAMC Form 648	P	Changes to automation form				MISO prepunches day of the week, clinic no., Dx codes, date and time
MISO returns cards to CAS		Clerical	O	Appointment cards	O	TAMC Form 648						3 times day turn around
CAS checks cards for accuracy and files them by clinic and position	Organization to issue cards	Clerical	P	Appointment cards	P	TAMC Form 648						Filed in rotary file in CAS
Appointments are made by CAS	Process cancels for appointment	Clerical, communication	P	Appointment cards	P	TAMC Form 648	P	Patient needs matched to clinic capabilities				Must obtain demographic data from pat. name, rank, sex, SSN, date and whether or not pat. must bring own medical record
Appointment cards are returned to MISO		Clerical	O	Appointment cards	O	TAMC Form 648						Cards sent to MISO three times daily (8:30, 12:30, 15:30)
MISO keypunches patient data onto appointment card	Transcription of appointment	Keypunch operator	P	Appt. cards	P	TAMC Form 648	P	Copy changes to EDP form				
Cards are sent to MISO and appointments printed.	Input data information	Keypunch operator, card readers and printers	P	Appt. cards	P	TAMC Form 648						Cards usually very accurate
Cards and appointment listing returned to CAS		Clerical skills	O	Appt cards	O	TAMC Form 648						

CURRENT LOGIC	TIME	PERSON PERFORMING	INFORMATION		MATERIEL		INFORMATION						SPECIAL FEATURES
			TYPE		TYPE		TYPE						
Appt. cards returned to CAS and held until two days prior to the appointment	Weekly	Admin/clerical	P				P	Complete					Needs date of appointment by date. Completed cards by RTS will be added to this file
Appt cards returned to MISO two days prior to appt.	Can be processed	Admin/clerical	P										
MISO provides sorters and cards	Full record-keeping services of this kind	Computer operator	P		P	Info taken from cards & put onto printout sheets	P	Information printed on printouts by clinic and doctor and alphabetically					Printouts include: all patients, coded printed for those that have seen dr at TAMC
MISO sends cards and sorters to CAS		Admin/clerical	O	Same info now in different form									
CAS distributes cards and sorters	Full records and uniform services	Admin/clerical	P				P	Info from CAS now in final form & sent to the users.					TAMC PCF print cards used at CORS do be used as appointment cards. Copies of sorter also to CORS. Clinics receive a sorter of typed pts, chronologically and by Dr.
CORS pulls records and sends to clinics prior to the appointment.	Provide record to physician		P				P	CAS provided info to CORS through MISO					Pulls other than TAMC PCF bring own records.
Pt. arrives in clinic	Health Care	Physician/health care provider											Marks the end of the CAS system.
Clinics adds appropriate information to appt cards		Admin/clerical	P				P	Diag. code, Dr. codes if multiple appts, procedure codes and cancellations as appropriate					Marks beginning of workload getting into system.
Clinics returns cards to MISO	Transfer of data	Admin/clerical	O	Appt. cards	O	TAMC Form 618							Cards are used to update MISO and CORS files.

Procedure	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]					[illegible]
MISO keypunches cards and [illegible] error listing [illegible]	[illegible] data and inventory	Keypunch operator	P	Error listing	P	Computer printout	P	Form changed					[illegible] copies provided [illegible] with incorrect clinic code or pnt category rejected.
[illegible] copy of error listing sent to Med Stats and Clinical Support Division	Correction of errors	Clinical/admin	I	Error listing									Med stats corrects all clinic code and pnt cat. errors and returns [illegible] to MISO. Other errors rarely corrected.
MISO corrects errors and prepares summary cards	Correction [illegible] data	Keypunch clerk	I										Summary cards for clinics, pnt categories, [illegible] and diag.
End of month run prepared from summary cards	Med 302 Report		O										Final product

APPENDIX B

INTERVIEW QUESTIONS

1. Do you trust the computer and MISO to provide accurate summaries of your workload?

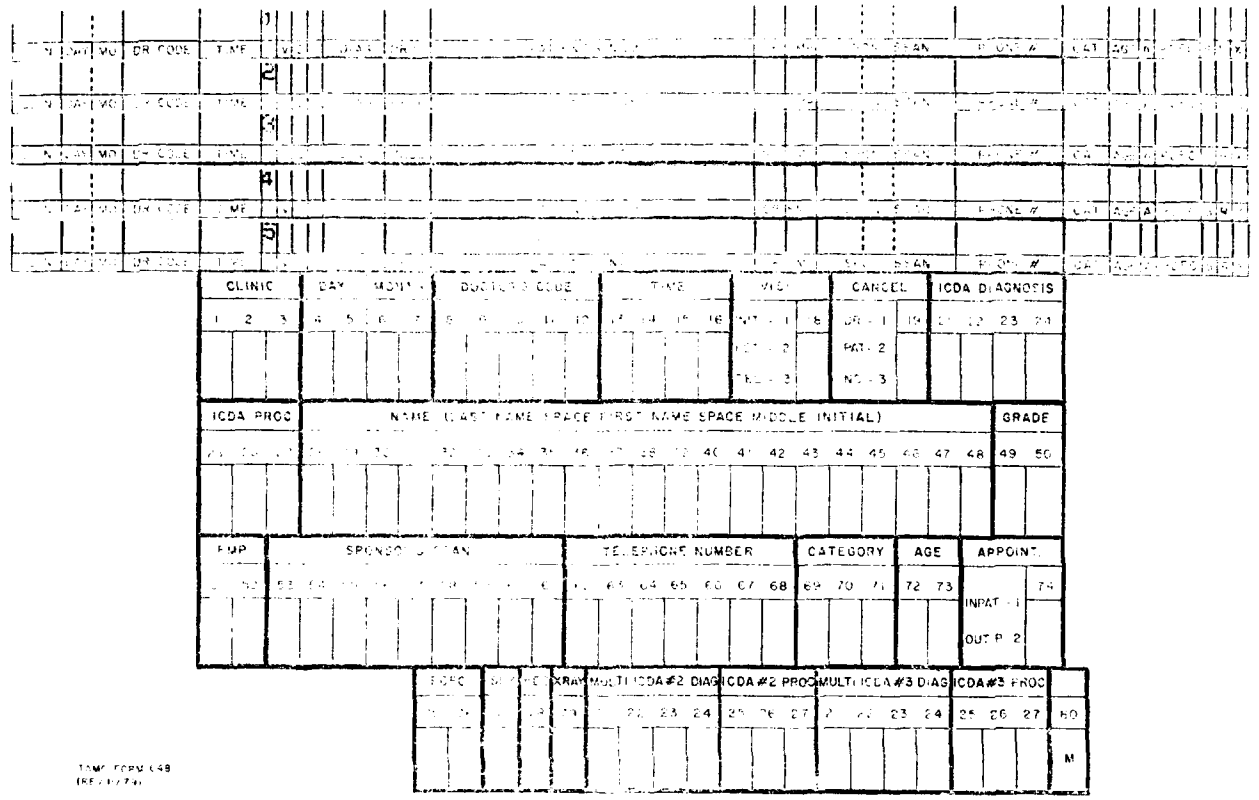
2. Have you met or do you know any of the MISO personnel?

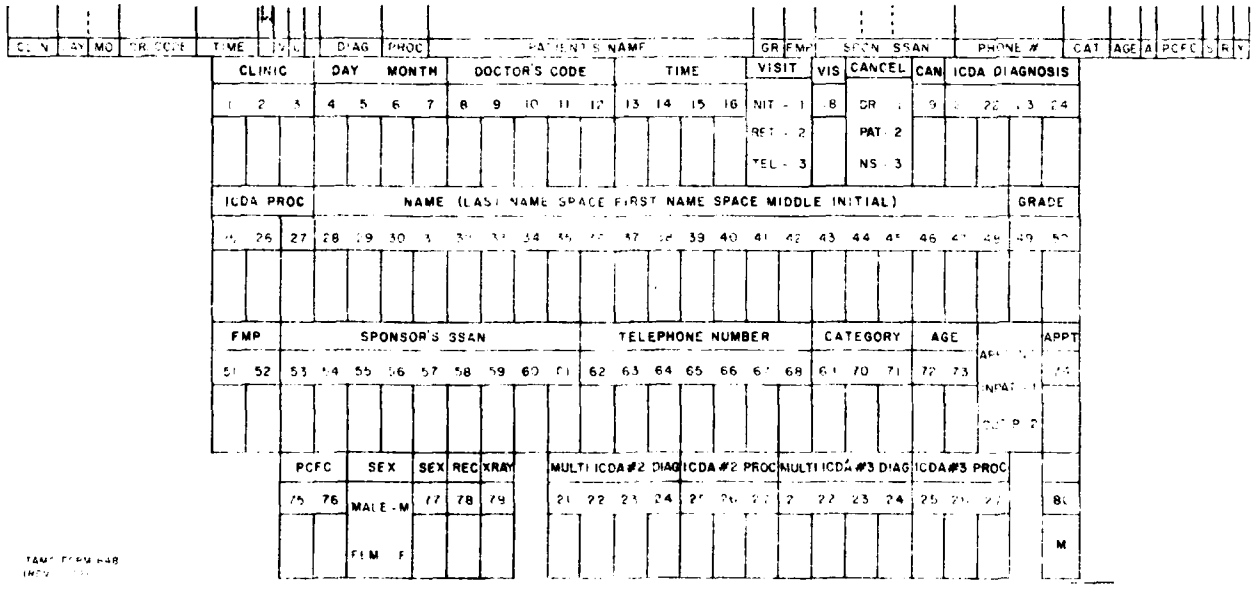
3. Do your numbers and the computer numbers normally agree?

4. How would you improve the system?

APPENDIX C

CAS FORMS AND CLINIC LIST


CLINIC
DAY
MONTH
DOCTOR'S CODE
TIME
VISIT
NIT - 1
RET - 2
TEL - 3
CANCEL
DR - 1
PAT - 2
NS - 3
ICDA DIAGNOSIS
ICDA PROC
NAME (LAST NAME SPACE FIRST NAME SPACE MIDDLE INITIAL)
GRADE
FMP
SPONSOR'S SSAN
TELEPHONE NUMBER
CATEGORY
AGE
APPOINT.
INPAT - 1
OUT P - 2
PCFC
SEX
MALE - M
FEM - F
REC XRAY
MULTI ICDA #2 DIAG
ICDA #2 PROC
MULTI ICDA #3 DIAG
ICDA #3 PROC
M


CLINIC
DAY
MONTH
DOCTOR'S CODE
TIME
VISIT
NIT - 1
RET - 2
TEL - 3
CANCEL
DR - 1
PAT - 2
NS - 3
ICDA DIAGNOSIS
ICDA PROC
NAME (LAST NAME SPACE FIRST NAME SPACE MIDDLE INITIAL)
GRADE
FMP
SPONSOR'S SSAN
TELEPHONE NUMBER
CATEGORY
AGE
APPT
INPAT - 1
OUT P - 2
PCFC
SEX
MALE - M
FEM - F
REC XRAY
MULTI ICDA #2 DIAG
ICDA #2 PROC
MULTI ICDA #3 DIAG
ICDA #3 PROC
M

CAS CLINICS

Pulmonary Clinic
Cardiology Clinic
Internal Medicine
Gastroenterology Clinic
Pediatric Gen. Sick Baby
Pediatric Allergy Clinic
Pediatric Cardiology
Pediatric Infectious Disease
Pediatric Dermatology
Pediatric Endocrine
Pediatric Hematology
Pediatric Neurology
Pediatric Renal Clinic
Hematology-Oncology Clinic
Nephrology Clinic
Adolescent Pediatrics
Allergy Clinic
Dermatology Clinic
New OB Conference Clinic
Return OB Clinic
Complicated OB Clinic
Postpartum OB Clinic
OB-Kaneohe MNAS
OB-Schofield Barracks
OB-Barbers Point NAS
OB-Ultrasound
GYN-Routine Clinic
GYN-ASAP Clinic
Infertility Clinic
GYN Pre-Op.
GYN Post-Op.
GYN Pap Smear Clinic
GYN Cervical Clinic
GYN Oncology Clinic
Optometry Clinic
Opthalmology Clinic
Thoracic Surgery Clinic
Urology Clinic
IVP/XU Clinic
Retrograde Cystogram
Cystometrogram Clinic
Cystoscopy Clinic
Vasectomy Clinic
Circumcision Clinic
General Surgery Clinic
Surgical Proctology Clinic
Vascular Surgical Clinic
Neurology Clinic
Peds Well Baby Clinic
Peds Newborn Spec. Care
Peds A/D Army Dependents
Diet. Consult-Individual
Diet Consult-TAMC
Diet Consult-Weight Reduct.
Diet.-OB Conference
Diet HLP Type II B Class
Diet-Diabetes Class
Diet.-Gestational Disbetes
Complete Physical-P. Exam.
Complete Physical-Gen. Med.
Complete Physical-Peds
Complete Phys.-Adol. Peds

APPENDIX D

NON-CAS FORMS AND CLINIC LIST

CLINIC 1 - 3 | DATE 4 - 7 | DOCTOR CODE 8 - 12 | A 71 | PCF 75-76

CLINICAL APPOINTMENT WORKSHEET - Mornings

When completed, this form contains privacy act protected personnel data handle and destroy in accordance with applicable directives.

TIME 13 - 16	VIS 18	CAN 19	ICDA DIAGNOSIS 21 - 24	ICDA PROC 25 - 27	NAME (LAST NAME SPACE FIRST NAME MIDDLE INITIAL) 28 - 48	GRADE 49-50	FMP 51-52	SPON SSAN (LAST 4) 58 - 61	CAT 69 - 71	AGE 72-73	SEX 77
0815			MULTI ICDA 1		MULTI ICDA 2 CC=80	M					
0830			MULTI ICDA 1		MULTI ICDA 2 CC=80	M					
0845			MULTI ICDA 1		MULTI ICDA 2 CC=80	M					
0900			MULTI ICDA 1		MULTI ICDA 2 CC=80	M					
0915			MULTI ICDA 1		MULTI ICDA 2 CC=80	M					
0930			MULTI ICDA 1		MULTI ICDA 2 CC=80	M					
0945			MULTI ICDA 1		MULTI ICDA 2 CC=80	M					
1000			MULTI ICDA 1		MULTI ICDA 2 CC=80	M					
1015			MULTI ICDA 1		MULTI ICDA 2 CC=80	M					
1030			MULTI ICDA 1		MULTI ICDA 2 CC=80	M					
1045			MULTI ICDA 1		MULTI ICDA 2 CC=80	M					
1100			MULTI ICDA 1		MULTI ICDA 2 CC=80	M					
1115			MULTI ICDA 1		MULTI ICDA 2 CC=80	M					

CLINIC 1 - 3 | DATE 4 - 7 | DOCTOR CODE 8 - 12 | A 74 = 2 | PCF 75-76 = 11

CLINICAL APPOINTMENT WORKSHEET - Afternoons

When completed, this form contains privacy act protected personnel data handle and destroy in accordance with applicable directives.

TIME 13 - 16	VIS 18	CAN 19	ICDA DIAGNOSIS 21 - 24	ICDA PROC 25 - 27	NAME (LAST NAME SPACE FIRST NAME SPACE MIDDLE INITIAL) 28 - 48		GRADE 49-50	FMP 51-52	SPON SSAN (LAST 4) 58 - 61	CAT 69 - 71	AGE 72-73	SEX 77
1315												
			MULTI ICDA 1		MULTI ICDA 2	CC=80	M					
1330												
			MULTI ICDA 1		MULTI ICDA 2	CC=80	M					
1345												
			MULTI ICDA 1		MULTI ICDA 2	CC=80	M					
1400												
			MULTI ICDA 1		MULTI ICDA 2	CC=80	M					
1415												
			MULTI ICDA 1		MULTI ICDA 2	CC=80	M					
1430												
			MULTI ICDA 1		MULTI ICDA 2	CC=80	M					
1445												
			MULTI ICDA 1		MULTI ICDA 2	CC=80	M					
1500												
			MULTI ICDA 1		MULTI ICDA 2	CC=80	M					
1515												
			MULTI ICDA 1		MULTI ICDA 2	CC=80	M					
1530												
			MULTI ICDA 1		MULTI ICDA 2	CC=80	M					
1545												
			MULTI ICDA 1		MULTI ICDA 2	CC=80	M					
			MULTI ICDA 1		MULTI ICDA 2	CC=80	M					

TANC FORM 287-1, 1 Nov 78

CLINIC 1 - 3	DATE 4 - 7	DOCTOR CODE 8 - 12	DC 17

CLINICAL APPOINTMENT WORKSHEET

When completed, this form contains Privacy Act protected personnel data
Handle and destroy in accordance with applicable directives.

TIME 13 - 16	VIS 18	CAN 19	ICDA DIAGNOSIS 21 - 24	ICDA PROC 25 - 27	NAME (LAST NAME SPACE FIRST NAME MIDDLE INITIAL) 28 - 48	GRADE 49-50	FMP 51-52	SPON SSAN (LAST 4) 58 - 61	CAT 69 - 71	AGE 72-73	A 74	PCF 75-7
MULTI ICDA #2					MULTI ICDA #3 CC=80 M							
MULTI ICDA #2					MULTI ICDA #3 CC=80 M							
MULTI ICDA #2					MULTI ICDA #3 CC=80. M							
MULTI ICDA #2					MULTI ICDA #3 CC=80 M							
MULTI ICDA #2					MULTI ICDA #3 CC=80 M							
MULTI ICDA #2					MULTI ICDA #3 CC=80 M							
MULTI ICDA #2					MULTI ICDA #3 CC=80 M							
MULTI ICDA #2					MULTI ICDA #3 CC=80 M							
MULTI ICDA #2					MULTI ICDA #3 CC=80 M							
MULTI ICDA #2					MULTI ICDA #3 CC=80 M							
MULTI ICDA #2					MULTI ICDA #3 CC=80 M							
MULTI ICDA #2					MULTI ICDA #3 CC=80 M							

TAMC FORM 287-2, 1 Jan 79

WALK-IN VISIT WORKSHEET

CLINIC	DAY MONTH	DOCTOR'S CODE	TIME		VISIT		CANCEL		DIAGNOSIS		PROC	
1 2 3	4 5 6 7	8 9 10 11 12	13 14 15 16	17	INIT - 1 RET - 2 TEL - 3	18	DR. - 1 PAT - 2 NS - 3	19	21 22 23 24		25 26 27	

NAME (LAST NAME SPACE FIRST NAME SPACE MIDDLE INITIAL)	GRADE	FMP
28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48	49 50	51 52

SPONSOR'S SSAN	TELEPHONE NUMBER	CATEGORY	AGE	APPOINT.	
53 54 55 56 57 58 59 60 61	62 63 64 65 66 67 68	69 70 71	72 73	INPAT - 1 OUT P - 2	74

PCFC	SEX	REC	XRAY	MULTI#2 DIAG	#2 PROC		MULTI#3 DIAG	#3 PROC	
75 76	77	78	79	21 22 23 24	25 26 27	80 M	21 22 23 24	25 26 27	80 M

TAMC FORM 287-3, 1 Dec 79

NON-CAS CLINICS

G.I. Diagnostic Clinic

Medical Proctology Clinic

Medical Consult Clinic

Rheumatology Clinic

Diabetes Clinic

Endocrine Clinic

OB Stress Clinic

Neurosurgery Clinic

Plastic Surgery Clinic

CMHA, TAMC

Hale Nui, Fort Shafter

Child-Adolescent Psych.

CMHA, SB

Psych. Nursing, SB

Psychology Clinic, SB

CMHA, Social Work, SB

Psychology, TAMC

Psychology Testing

Occupational Health, SB

Occupational Health, TAMC

Physical Med Clinic

Podiatry Clinic

Family Practice, TAMC

Immunology Therapy Clinic

Family Planning Clinic

Minor Surgery Clinic

Army Health Nsg, TAMC

Army Health Nsg, SB

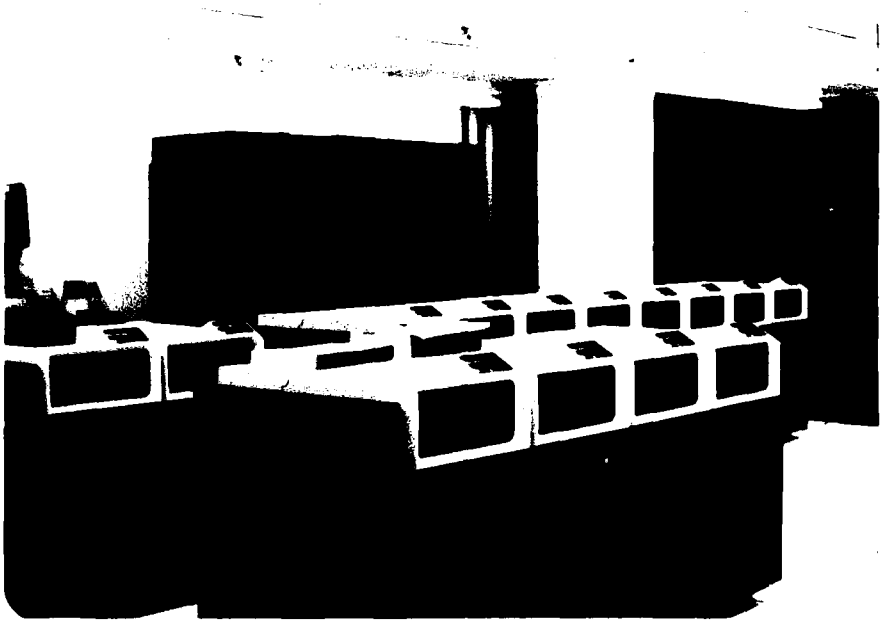
Peds-Breastfeeding Clinic

APPENDIX E

GRAPHICAL DISPLAY

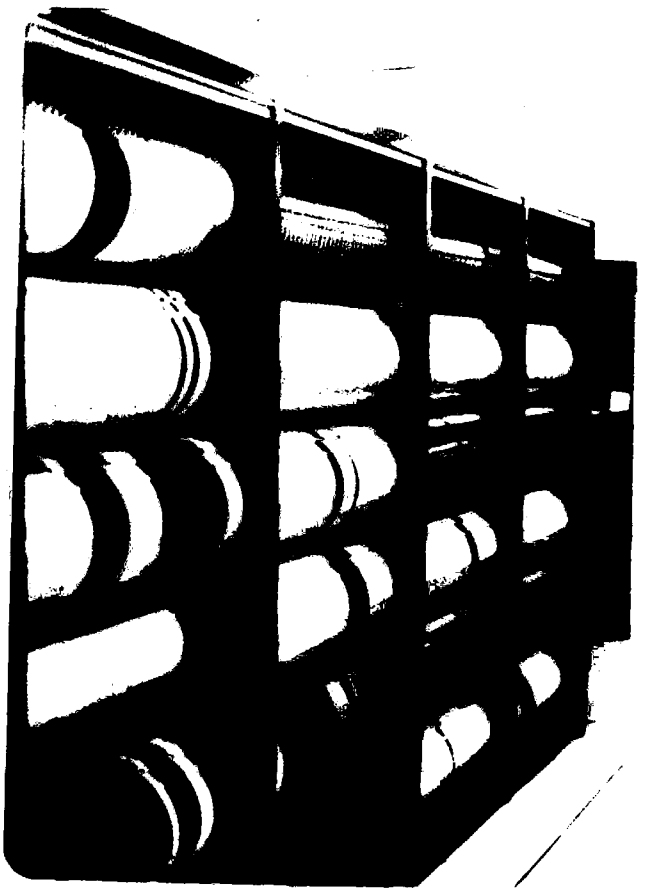
IBM 3031 COMPUTER IS CONTROLLED BY

CENTRAL CONTROL CONSOLE



ALL PATIENT DATA IS PLACED ON DISK PACKS INITIALLY

AND LATER TRANSFERRED TO MAGNETIC TAPE FOR



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8